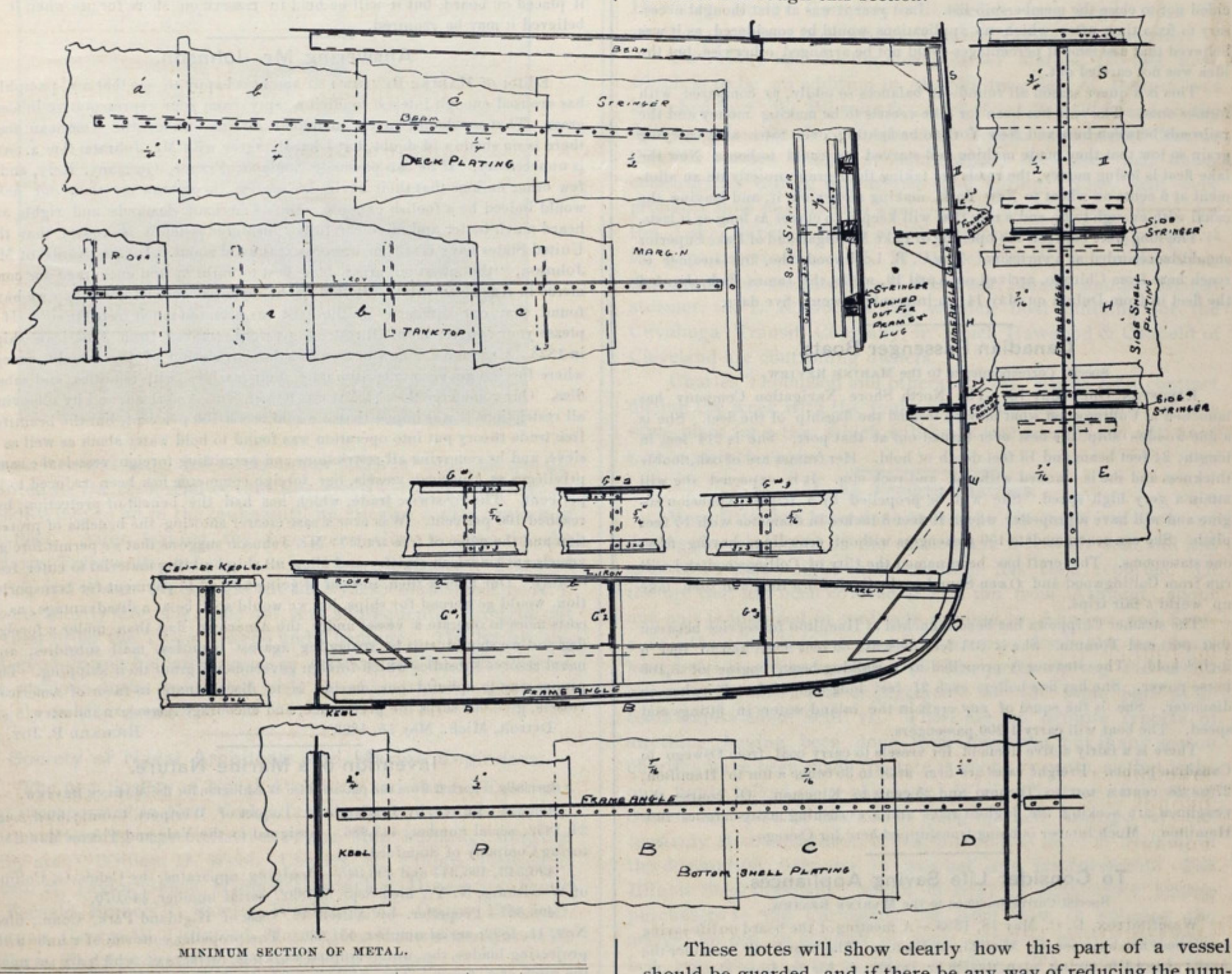
MARINE REVIEW.

VOL. VII. CLEVELAND, O., AND CHICAGO, ILL., MAY 18, 1893. No. 20.

Steel Ship Construction.—Part I.

UNAVOIDABLE WEAKEST SECTION OF METAL VESSELS.

This section is of considerable importance in the building of iron and steel vessels, and should be carefully considered by all having a part in their construction. The center keelson, girders, side stringers, tank top plating, fender angles, deck stringer, deck plating and shell plating, shown by plans and sections, are the only parts of the structure resisting a strain tending to break a vessel crosswise.



MINIMUM SECTION OF METAL.

PARTS OF THE STRUCTURE.	Total square in.	Rivet holes, number.	Effective. square in.
Center keelson and girders, including angles	98.75	64	80.00
Side stringers, including angles	49.50	28	41.05
Keel and bottom shell plating, A, B, C & D	308.62	92	274.57
Side shell plating, E, H, I, & S	200.75	64	176.75
Rider plate, tank top, a, b and c, margin and angle,	176.50	82	153.44
Deck stringer, deck plating, a′, b′ and c′ and stringer angle	156.50	80	137.70
	990.62	410	838.51

The table showing minimum section of metal is for both sides of vessel.

990.62 square inches is the unpunched material.

838.51 square inches is the punched material.

There are 410 holes punched out to receive the rivets, which amount to 152.11 square inches.

Assuming 30 tons per square inch, there is a reduction of 4,563.30 tons caused by punching out rivet holes.

The spacing of rivet holes is from eight to nine diameters of the rivets, and in no instance should they be less than eight diameters through this section.

These notes will show clearly how this part of a vessel should be guarded, and if there be any way of reducing the number of rivet holes shown in the sketches, such reduction will be of much assistance in preventing a vessel from parting in two.

Side stringers shown on the plan are 20 inches by 3/8 inch thick, 5 inches being punched out for the frame, showing that the material from the edge of the frame to the shell plating is of no use in adding to the metal at this section. If this plate was fitted on the inside of the frame and the angle continuous, instead of intercostal, there would be 4.125 square inches for each stringer, amounting in all to 16.5 square inches or 495 tons, being of benefit to the vessel. There may be a little benefit in the side stringer being fastened to the shell when the shearing of rivets is considered, but it is questionable if it be worth the cost of workmanship and waste of material.

Affairs of the Lake Carriers' Association.

Special Correspondence to the MARINE REVIEW.

BUFFALO, N. Y., May 18.—The final agreement providing for reciprocity in wrecking has not yet been made. If things go on in this way the season will be over before there is a legal right to go into foreign waters on the lakes and save a vessel. It is true that the steamer Reynolds was lately saved from Windmill point, in sight of Buffalo, by our tugs, but it was done at the risk of the tugs engaged in the work. Secretary Keep of the Lake Carriers' Association has kept his promise and opened a correspondence with the secretary of state on the subject, and has just received a letter from the department stating that the British minister in Washington is now the obstacle. On March 24 he was reminded of his duty in the matter, but failed to do it. The secretary promises to stir him up again soon.

It is pleasant to observe two things in connection with the Lake Carriers' Association. First, that it is becoming such a power in lake matters, and next, that it uses its power so well. There is very little opposition to the shipping offices, the turbulent seamen's unions having given up the ghost, and with Congress adjourned there is now very little to do. Already the membership is 40,000 tons larger than last year, amounting to 600,000 tons. It has been decided not to close the membership list. Last year it was at first thought necessary to fix a time after which no applications would be considered, as it was believed that assessment percentages could not be arranged otherwise, but the idea was not carried out.

This is a queer season all round—it balances so oddly, as compared with former ones. The rule has been for lake veesels to be making money and the railroads between here and New York to be fighting over rates and carrying grain so low that they made nothing and starved the canal to boot. Now the lake fleet is losing money, the roads are taking their grain quietly on an allotment at 6 cents on wheat to New York, making money on it, and leaving the canal with enough to do and a rate that will keep it in clover as long as it lasts.

The long wait between the opening of Lake Michigan and of Lake Superior should be recorded as a curiosity. The C. B. Lockwood, the first steamer to reach here from Chicago, arrived on April 19, while the James Fisk, Jr., led the fleet in from Duluth on May 14, an interval of twenty-five days.

Canadian Passenger Boats.

Special Correspondence to the MARINE REVIEW.

KINGSTON, Ont., May 18.—The North Shore Navigation Company has launched at Collingwood what may be termed the flagship of the fleet. She is a fine wooden ship, the best ever turned out at that port. She is 214 feet in length; 34 feet beam and 13 feet depth of hold. Her frames are of oak, double thickness and she is planked with oak and rock elm. It is expected she will attain a very high speed. She will be propelled by a triple expansion engine and will have a propeller wheel 10 feet 8 inches in diameter with 15 feet pitch. She can accommodate 150 passengers without crowding, having fifty-one staterooms. The craft has been named the City of Collingwood and will run from Collingwood and Owen Sonnd to the Sault for a time and then take up world's fair trips.

The steamer Chippewa has been launched at Hamilton for service between that port and Toronto. She is 311 feet over all, 36 feet beam and 13 feet 6 inches hold. The steamer is propelled by a walking-beam engine of 3,100 horse power. She has five boilers each 21 feet long and 10 feet 4 inches in diameter. She is the equal of any craft in the inland waters in fittings and speed. The boat will carry 1,200 passengers.

There is a fairly active demand for vessels to carry coal from Oswego to Canadian points. Freight rates are firm at 30 to 35 cents a ton to Hamilton, 27 to 28 cents a ton to Toronto and 25 cents to Kingston. Of course the vesselmen are seeking the highest rates and are rushing many cargoes into Hamilton. Much lumber is being transhipped here for Oswego.

To Consider Life Saving Appliances.

Special Correspondence to the MARINE REVIEW.

WASHINGTON, D. C., May 18, 1893.—A meeting of the board on life saving appliances has been set for May 23, at Boston. The board will consider the merits of any life saving plan, device or invention, for use from shore only, submitted to it, and if in its opinion the device is useful in saving life, will recommend it to the government for adoption. The meeting will probably continue a week. Supt. Kimball of the life saving service, though not a member, will as usual be present. The board is constituted as follows: President, Prof. Cecil H. Peabody, Massachusetts Institute of Technology, Boston; recorder, Lieut. Thomas D. Walker, United States revenue marine, assistant inspector life saving stations, Washington; members, Capt. Charles A. Abbey, United States revenue marine, inspector of life saving stations, No. 24 State street, New York City; Capt. David A. Lyle, ordnance department, box 1606, Philadelphia, Pa.; Benjamin C. Sparrow, superintendant second lifesaving district, East Orleans, Mass.; Jerome G. Klab, superintendant tenth life saving district, Sand Beach, Mich.; Herbert M. Knowles, assistant superintendant third life saving district, Wakefield, R. I.

Unofficial reports received at the navy department emphatically deny the sensational stories telegraphed from San Francisco alleging a complete wreck of the boilers of the new coast defense vessel Monterey. The reports are from naval officers, who were aboard her during a recent run made for the benefit of the special investigating committee.

The stock holders of the Monumental Construction Company at Baltimore, a few days ago discussed the building of their novel boat the Howard Cassard. Twenty thousand shares of stock of the 25,000 were represented. Howard Cassard, the president of the company, in his annual report referred encouragingly to the construction of the steamer, that is expected to revolutionize by its speed steamship construction. He said that it had been demonstrated that the Cassard was seaworthy and comfortable, and all that was left to be developed was her speed.

It has been decided by the bureau of construction to put no more cellulose in naval ships at present, but to store it in navy yards ready for use on short notice. This does not mean the abandonment of the water excluding material, but only that it will not be placed aboard ships in time of peace, for the reason that it is believed it might prove harmful to the steel frames by rotting in warm climates. The New York is the first vessel to try cellulose, and as she already has it in her cofferdams it will be allowed to remain for the present. Other ships constructed with a view to adopting the material will not, however, have it placed on board, but it will be held in reserve on shore for use when it is believed it may be required.

Answering Mr. Johnson.

Editor of MARINE REVIEW: I am most happy to see that my pamphlet has aroused enough interest to elicit a reply from your representative in Congress. That we should have a merchant marine, under the American flag, there is no shadow of doubt, but I hardly agree with Mr. Johnson that a navy is unnecessary. If he can persuade England, France, Germany, Italy, and a few other nations that their navies are useless incumbrances, then our navy would indeed be a foolish expense. But American demands and rights are heard much better and more carefully considered when it is known that the United States navy is still in business at the old stand. In the words of Mr. Johnson, "the question arises how best to build up and encourage our commerce in American ships. Should it be by more restrictions, when we have found that our difficulty in the past has been too much restriction." If it please your congressman, all restrictions were removed from American ships in 1828. Commerce is now as free as "the circulation of the blood" except where foreign governments stimulate their marines with bounties and subsidies. Our commerce then (1828) was 90 per cent. American, and by removing all restrictions it was hoped that it would reach 100 per cent, but the beautiful free trade theory put into operation was found to hold water about as well as a sieve, and by removing all restrictions and permitting foreign vessels the same privileges as American vessels, our foreign commerce has been reduced to 20 per cent. The coastwise trade, which has had the benefit of protection, has reached 100 per cent. Was ever a case clearer showing the benefits of protection and the curse of free trade? Mr. Johnson suggests that we permit foreign vessels an American registry and allow all ship building material to enter free of duty. Our money then, instead of going abroad in payment for transportation, would go abroad for ships, but we would still be at a disadvantage, as it costs more to operate a vessel under the American flag than under a foreign flag and we should still be struggling against bounties, mail subsidies, and naval reserve subsidies which foreign governments grant their shipping. The proper way to upbuild our marine is to discriminate in favor of American vessels, give our ships the preference, and encourage American industry.

Detroit, Mich., May 15, 1893. RICHARD P. JOY.

Invention of a Marine Nature.

Specially reported from the patent office Washington for the MARINE REVIEW.

496,328—Pulley, by Benjamin L. Toquet of Westport, Conn.; filed Aug. 24, 1892; serial number, 443,986. Assigned to the Yale and Towne Manufacturing Company of Stamford.

496,342, 496,344 and 496,345—Dredging apparatus, by Caleb G. Collins of Woodsburg, N. Y.; filed Sept. 5, 1892; serial number, 445,070.

496,857—Propeller, by Alfred W. Case of Highland Park, Conn.; filed Nov. 11, 1892; serial number, 451,630. The propeller consists of a hub with projecting blades, the uninterrupted working surfaces of which are set upon the pitch of a screw. The working surface of each blade is inclined at an angle to the pitch of the screw, so as to thrust outwardly as well as rearward.

496,895—Ships paint, by Ludwig Pflug of Kiel, Germany; filed July 25, 1892; serial number, 441,197. This is a composition of paint that contains hydrazin and its salts.

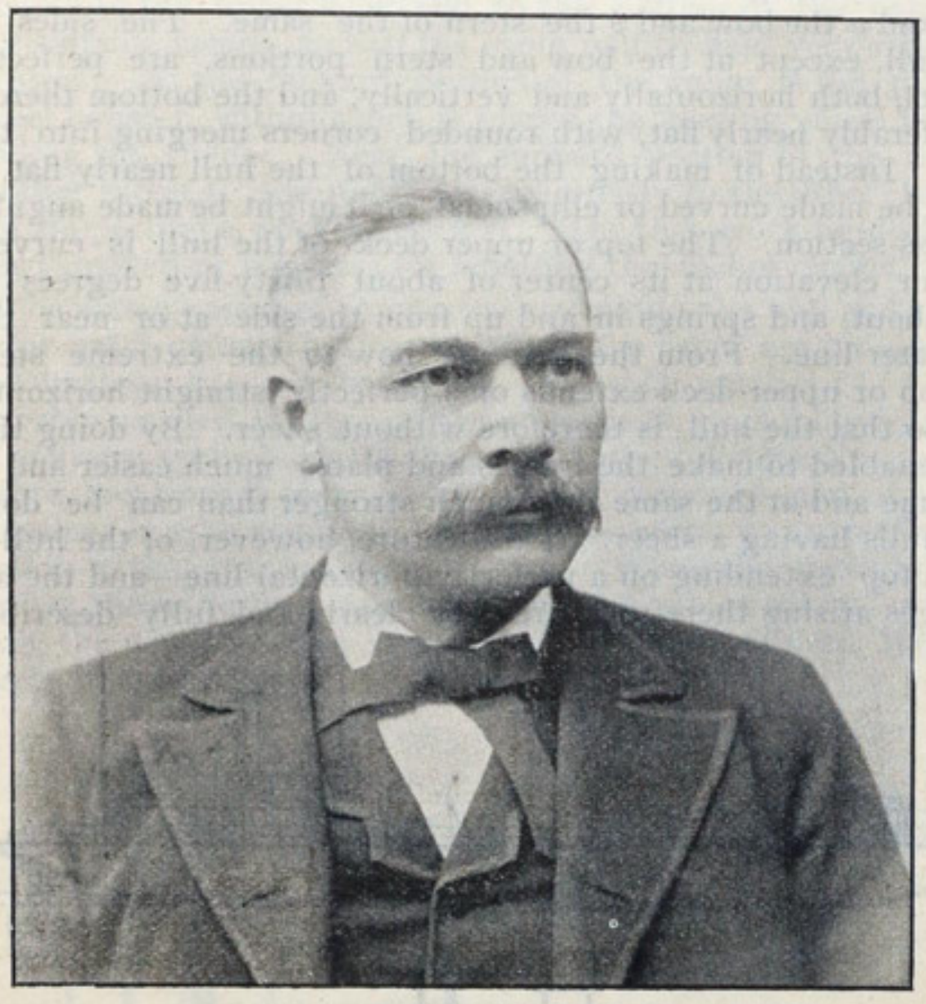
497,153—Fog signal, by George H. Williams of Newton, Mass.; filed May 26, 1892; serial number, 434,474. The device is of the pneumatic alarm whistle class, and the feature is the automatic mechanism.

497,180—Fire extinguisher, by Michael J. Holland of Jersey City, N. J.; filed Jan 22, 1891; serial number, 378,723. This apparatus is so arranged as to be applied to steamers.

497,249—Apparatus for raising sunken vessels, by Ernest Niehoff of Tacoma, Wash.; filed Oct. 4, 1892; serial number, 447,787. The device is the familiar one of air bags, filled from above the surface after placing them in the hold of the vessel. The novel features are in the form of bag and the manner of couplings.

Capt. Samuel Shannon.

Capt. Samuel Shannon, who died of pneumonia at Duluth on Friday, was well known for many years in lake marine circles. He was fifty-two years of age and had followed the lakes from boyhood up to about four years ago, when he began a vessel brokerage and marine insurance business in Duluth. When the Union Steamboat Company of Buffalo was running steamers solely on Lake Erie, he had reached the position of mate, and his connection was mainly with that corporation. When



the service was extended to the upper lakes in 1869, he was appointed to the command of the Evergreen City. From her he steadily moved up in the ranks until he became senior captian of the fleet. After leaving the Evergreen City he was in the Eclipse, Toledo, Pacific, St. Louis, Dean Richmond, Starucca Arctic and Avon. He brought out the Nyack, commanded the H. J. Jewett shortly after she came out, and subsequently brought out in their order the Tioga, Owego and Chemung. His health was not good during his latter years of service, and he retired from the arduous duties connected with the big steamer Chemung largely on that account.

Society of Naval Architects and Marine Engineers.

The new Society of Naval Architects and Marine Engineers was incorporated in New York a few days ago, and the incorporators are leading representatives of the ship building industry. They are: William H. Webb, Charles H. Cramp, George E. Weed, H. Taylor Gause, William T. Sampson, Horace See, Frank L. Fernald, Francis T. Bowles, Washington L. Capps, Edwin D. Morgan, George W. Quintard, Harrington Putnam and Jacob W. Miller. The first meeting will be held in autumn.

Clearing the Stocks.

Next week the Cleveland Ship Building Company will launch the Bradley steamer Alva, and there will then be four of the steel plants on the lakes with idle berths, most of the yards engaged in the construction of wooden vessels having already reached that condition. The three other steel yards at which work has thus been reduced are the Chicago Ship Building Company, Craig Ship Building Company of Toledo, and Union Dry Dock Company of Buffalo. At the latter yard a steel freight boat for the Lake Erie Transportation Company is still on the stocks but is well along toward launching. There is, of course, some finishing work at all of these yards but contracts of importance are practically completed. The Globe Iron Works Company of Cleveland and the Detroit Dry Dock Company are still in the midst of their work on passenger vessels, and F. W. Wheeler & Co. of West Bay City and the American Steel Barge Company of Superior will be busy into the middle of summer with keels laid during the fall and winter, but the outlook for new work is certainly not encouraging. Just previous to the opening of navigation, President Coffinberry of the Cleveland Ship Building Company had contemplated putting down a keel on yard account, but the discouraging condition of early freights has prevented any new work in Cleveland as well as at the other places named.

St. Lawrence river steamboat companies have contributed to a spurt of activity in Canadian yards by replacing some of their old passenger boats with modern steamers. An account of the launching of two such vessels appears in a letter from Kingston elsewhere in this issue, and it is said in addition that the Hamilton Bridge Company will before long begin work on another passenger boat for the Niagara Navigation Company.

On Friday last the big steel steamer Merida, 360 feet keel, which is to be an addition to the Whitney fleet of Detroit, was launched by F. W. Wheeler & Co. of West Bay City, and on the following day Curtis & Brainard of Toledo launched at Marine City the wooden lumber schooner which they have had under construction during the winter and spring. They will very probably now put down a keel for a lumber steamer fitted for the Lake Superior trade, which gives promise of improvement for some time to come. F. W. Wheeler & Co. will, within a few days, probably on Saturday of this week, launch another freight steamer, the L. R. Doty, a big wooden boat building for the Cuyahoga Transit Company, in which Hawgood & Canfield of Cleveland are controlling owners.

Charles Thompson and others of Port Huron let a contract during the week with the Jenks Ship Building Company of the same place for a tug, which will be 88 feet over all and will have a 22 x 26-inch engine.

Lake Freight Matters.

Very little has been done in freight contracts on iron ore during the week, and on the whole there is less ore sold and less covered by lake freight contracts than has been reported. Of the ore that has been covered at $1 a ton from Ashland, about one-half is included in contracts running to Aug. 10 and Sept. 1, and the other half for the full season. Probably ten boats have been placed to run light to Marquette during the entire season at $1, and a few engagements for the same port at 90 cents expire about Sept. 15. There are no definite reports of anything having been done from Escanaba, but if any season charters have been made the rate is about 75 cents, as that is the only figure talked of by shippers. While it is true that vessel owners can not take chances in tying up their tonnage very extensively at these figures, it is also true that there is nothing in the demand for iron ore to warrant any improvement. The Illinois Steel Company, which is next in importance among purchasers to the Carnegies, has been slow in entering the market for ore, on account of some supplies carried over from last year and a fear of labor troubles. The refusal of the Wisconsin Central syndicate mines to accept $3.75 a ton as a price for standard Bessemers is also a drawback to an active market. Rates on single trips are 95 cents from the head of Lake Superior, 85 cents from Marquette and 60 cents from Escanaba.

To anyone interested in the use of steam: Drop a postal card to W. D. Kearfoot, Cleveland sales agent for Henry R. Worthington of New York, and he will be pleased to send a table of mean effective pressures that is neat, convenient and more complete than anything as yet published.

A subscriber to the REVIEW wishes to obtain an anchor weighing from 200 to 350 pounds and having some connection with early lake history. Anyone knowing of such an anchor will find it to their advantage to communicate with the REVIEW.

During the past week, the American Shipmasters' Association of New York, publishers of the Record of American and Foreign Shipping, classified the American schooner Eugene Borda, American three-masted schooner Maud Briggs and American screw steamer Yemassee.

It is said that a speed of 18 miles an hour has been guaranteed for the steam yacht U. C. M., launched a few days ago at Detroit and built by the Coller Steam Yacht and Engine Works for C. H. Preston. If 19 miles are made the report says a premium of $500 will be paid to the builders.

Sales of vessel property: Tug Perfection, Capt. James Davidson of West Bay City to Dunham Towing Company of Chicago; Schooner Guiding Star, Eli and Isadore Twombley of Erin, Mich., to J, A. Allan of Sandusky; Rosalind, Capt, H. Dahlke of Chicago to Wm. A. Lydon and F. C. Drews, $5,500.

Buffalo to Cleveland in 11 hours and 20 minutes (distance 189 miles) is certainly very fair time for passenger service. This is a record credited to the side-wheel steamer State of Ohio, one of the boats of the new Buffalo-Cleveland line. The thorough manner in which this company with T, F. Newman as manager has equipped ware houses, offices, etc., seems like certain success.

Passenger steamers of the Cleveland-Buffalo line have been equipped with time detectors similar to those used in business houses and factories where night watchmen are employed. Lookouts on the steamers will be required to turn on, at stated periods, an electric current in these instruments, which are connected with the pilot house, instead of reporting in person, as in the past, to the pilot.

Supervising Inspector McMasters of Buffalo will probably be the first of the steambaat inspectors on the lakes to be removed by the Democratic administration at Washington, as he was the first supervisor to be appointed to a lake district by President Harrison. W. D. Robinson, John M. Laughlin and Wm. Dickson are candidates for the Buffalo position. According to report from Washington, Secretary Carlisle will permit the present incumbents, with the exception of one or two assistant locals who are slated for early removal to remain in office four years.

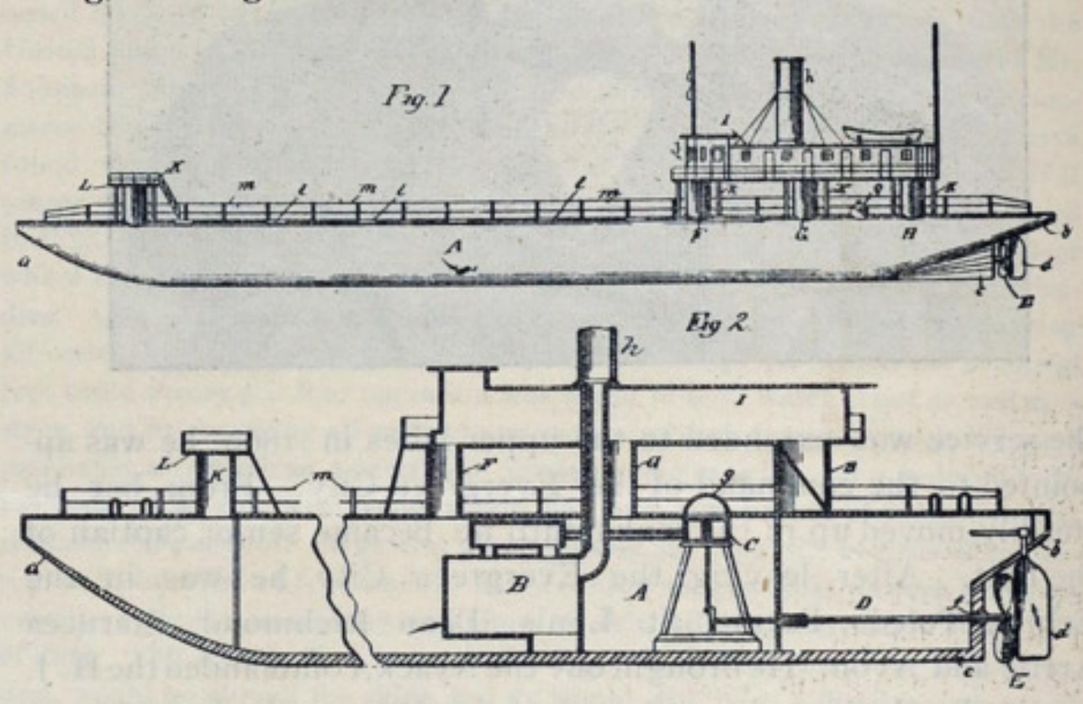
The Detroit & Cleveland Steam Navigation Company is now in its forty-third season, but with the opening of navigation each spring some new feature of improvement is found for the excellent service given in its different lines of passenger boats. In addition to the new steamers for the route between Detroit and Mackinac, a double daily service will be given between Cleveland and Detroit during July and August, connection being made at Put-in-Bay between the boats leaving Cleveland and Detroit each morning, and the regular night run continuing on last season's schedule.

Capt. Alex. McDougall's Patents.*

STEAM TOW BOAT—SPECIFICATIONS FORMING PART OF LETTERS PATENT NO. 429,468, DATED JUNE 3, 1890—APPLICATION FILED SEPT. 20, 1889.—NO MODEL.

In this specification the inventor refers to patents previously granted to him on the construction and form of hulk for tow boats and then describes the steam whaleback as follows:

"What I propose in the present application is the adaptation to steam tow-boats of a hull having the general characteristics already referred to, but with certain changes in form and construction that will adapt it more particularly to steam tow-boats, so that the tow-boat will carry its own power and will be capable of towing other vessels. What I also propose in the present application is the employment of several new and useful features with such a hull, as will be more fully hereinafter described and claimed. What I further propose in this application is to describe and claim several very important and advantageous features appertaining to said hulls, whereby the pitching and rolling of the hull in heavy seas is greatly reduced, thereby making the hull specially adapted to steam tow boats for the reason that under all ordinary conditions the propeller will be kept in the water. In the drawings, Fig. 1 is a side elevation of a steam tow-boat especially adapted for towing other vessels and for carrying freight; Fig. 2, a longitudinal sectional view of the same; Fig. 3, a side sectional view of Fig. 1, taken about midships and looking aft; Figs. 4 and 5, diagrammatical views of the hull of an ordinary steam tow boat, illustrating its different movements in pitching; Figs 6 and 7, diagrammatical views of a hull of my design under similar conditions; Figs. 8 and 9, diagrammatical cross-sectional views of the hull of an ordinary steam tow-boat, illustrating its different movements in rolling; and Figs. 10 and 11, diagrammatical cross-sectional views of a hull of my design under similar conditions. A represents the hull, and *a* the bow and *b* the stern of the same. The sides of this hull, except at the bow and stern portions, are perfectly parallel, both horizontally and vertically, and the bottom thereof is preferably nearly flat, with rounded corners merging into the sides. Instead of making the bottom of the hull nearly flat, it might be made curved or ellipsoidal, or it might be made angular in cross-section. The top or upper deck of the hull is curved, with an elevation at its center of about thirty-five degrees or thereabout, and springs in and up from the side at or near the low-water line. From the extreme bow to the extreme stern this top or upper deck extends on a perfectly straight horizontal line, so that the hull is therefore without sheer. By doing this I am enabled to make the frames and plates much easier and in less time and at the same time much stronger than can be done with hulls having a sheer. This feature, however, of the hull—viz., a top extending on a perfectly horizontal line—and the advantages arising therefrom are very clearly and fully described



in other patents. The bow of the present hull is spoon-shaped, but differs from the bows of my former boats in being materially longer and more pointed and with finer lines, so as to enter the water easily. The shape in cross-section of the hull at the bow portion changes gradually from that of an oval at the rear portion of the bow to that of a circle at the extreme forward end, the change being brought about by a gradual change of the upper deck from a flattened arch to a perfect semi-circle by a gradual upward curve of the bottom and by a gradual upward curve of the sides. The stern *b* is also made spoon-shaped and is built on practically the same lines as the bow. The stern, however, is provided with a skeg, *c*, covered with the metallic plating of the vessel and forming a part of the hull. The lower end of this skeg is in line with the bottom of the boat and extends out to a point some distance from the extreme rear end of the hull so as to leave an overhanging portion,

"When the boat is normally loaded, the extreme ends of both the bow and stern should be very near the surface of the water, so that in pitching the waves can ride up on the bow and stern, for the reason explained hereinafter. A usual rudder, *d*, is mounted on the rear end of the skeg and is operated by any suitable mechanism from the pilot-house. B represents a boiler, and C an engine of any suitable construction placed within the hull. For convenience, and in order that all machinery may be out of the way of the cargo, I place both the boiler and engine near the stern of the boat. The usual coal bunkers are placed near the boiler and preferably surround it. The engine C connects in the usual way with and operates the shaft D, carrying the propeller E. This propeller rotates directly in the rear of the skeg *c* and directly in advance of the rudder *d*. A suitable packing-box *f* is placed within the skeg, so as to surround the shaft and exclude water. A suitable dome or deadlight *g*, secured to the upper deck, gives light to the boiler and engine.

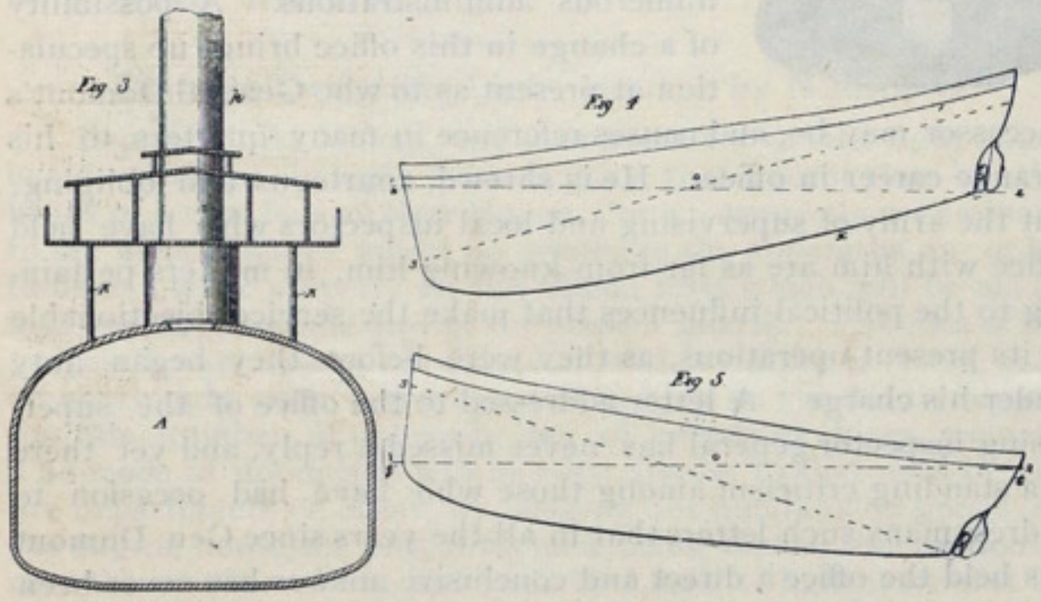
"Extending up from the upper deck and communicating with

*Under this heading we will publish specifications accompanying letters patent granted to Alexander McDougall since his first application for a patent on the whaleback type of vessel in March, 1880.

the interior of the hull are a number of hollow metallic cylindrical turrets F, G and H. These turrets are preferably fastened in position by means of a heavy angle-iron passing entirely around the bottom of the turret and riveted to the turret and also to the curved deck. The end turrets F and H each contain a staircase or steps whereby entrance is given to the hull and its different compartments from the cabin, and the central turret G encloses the smoke-stack *h* of the boiler. By thus encasing the smoke-stack it is effectively protected from the action of the waves thereon.

"Securely fastened on top of these turrets F, G and H is a cabin I, of any suitable and attractive design and construction. This cabin is further supported on each side by means of smaller pipes *k k*, secured to the upper deck and to the bottom of the cabin by any suitable means, so that the cabin will be held very rigidly in position. At the forward portion of the cabin is the pilot or wheel house J, within which is placed the steering wheel for controlling the rudder. Near the forward portion of the hull is another turret K, secured in place similarly to the other turrets, and supporting a working-deck L. On this working-deck is a usual capstan or windlass for handling the anchor-chains, &c.

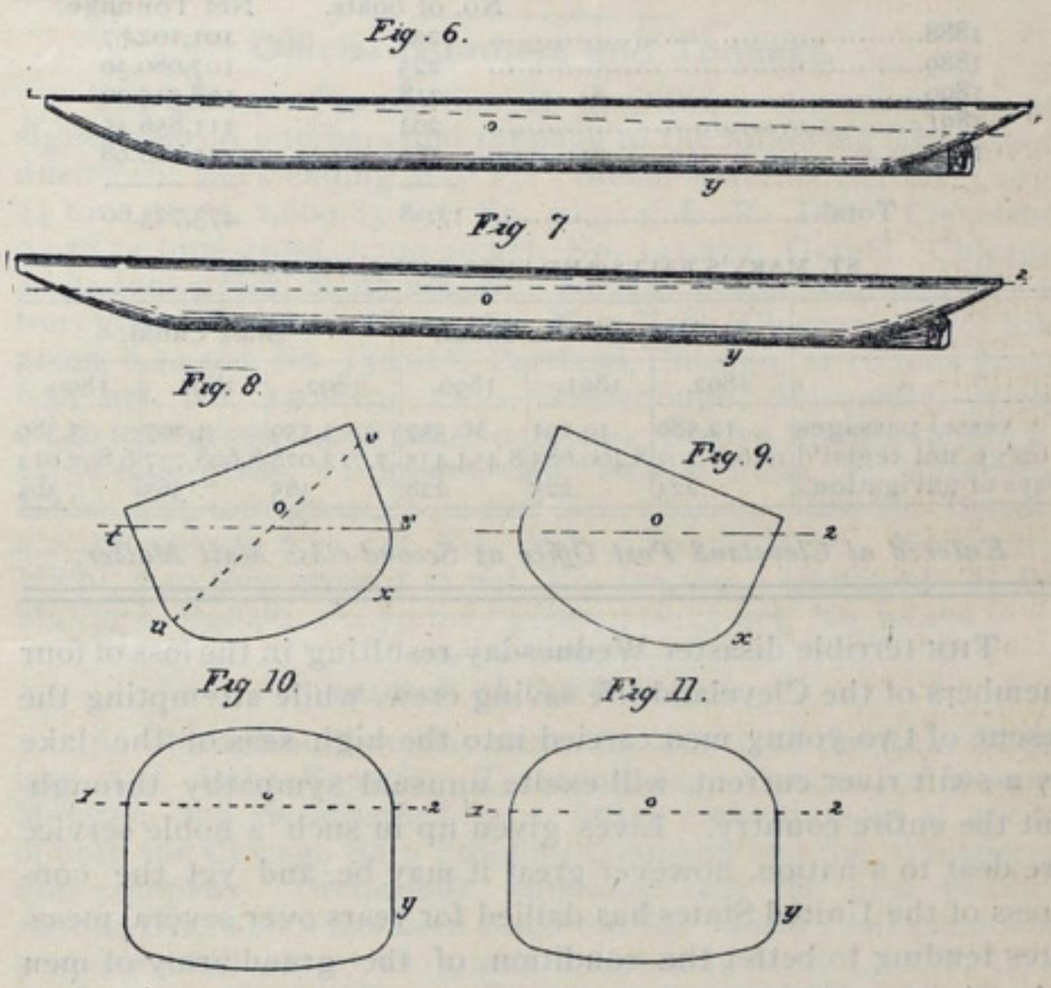
The arrangement of compartments within the hull and the interior constructions and rooms within the cabin are unimportant and irrelevant to my invention. Suitable hatches *l l l l* are removably secured in place on the upper deck, preferably by means of ordinary screw-bolts, as shown in Letters Patent No. 393,997, before mentioned, so as to be readily removed and replaced. Life-lines *m m m m* extend from bow to stern, so as to offer protection to the crew in severe weather. When the vesset is being loaded, these life-lines are to be removed, so as not to interfere with the usual loading apparatus, and when desired they can easily be set up again.



"In Fig. 4 the effect of the sea has been to move the boat *x*, so as to bury the bow under water and elevate the stern entirely out of the water, and thereby cause the propeller to race, much to the detriment of the machinery. The boat is therefore thrown out of its balance and the wedge-shaped air-space *o u s* is submerged and is exerting a powerful pressure upwardly, while the wedge-shapad portion *o v r* is out of the water and is exercising a powerful downward pressure by its weight. These two forces working together, tend to bring the boat back to its balance, but by reason of the momentum acquired and by the help of the action of the sea the center of gravity is passed, the reverse action takes place, and the vessel is thrown in the position shown in Fig. 5. Here the after air-space *o t u* is submerged and exerts an upward pressure. The bow portion *o s q* is elevated and exerts a downward pressure. Once more the boat moves toward its line of balance, but by reason of the momentum and the action of the waves the center of gravity is passed and the original position regained. The oscillating motion of the hull often continues long after the disturbing influence of the waves has ceased.

"From an inspection of Figs. 6 and 7 it will be seen that the action of the sea on boats of my design is entirely different from the action of the sea on ordinary vessels. As soon as a wave broaches a vessel of my design, the hull is thrown in the position shown in figures 6 and 7, with the bow slightly depressed and the stern slightly elevated, or vice versa. The water meeting with but little resistance now begins to climb up on the bow or stern, as the case may be, and exerts by its weight a downward force, opposing the upward pressure of the submerged portion. The powerful upward pressure caused by the submerged portion is thus eliminated by reason of the opposing force caused by the weight of the water on the submerged portion, and the hull regains its equilibrium solely by reason of the much less powerful force caused by the elevated portion of the hull. There is therefore but very little momentum acquired, and I have found by practical experience that the movement of the hull toward its line of balance is very slow and that the movement of the hull beyond the line of balance is very slight. The oscillating motion of the vessel after the effect of the waves has ceased is thus almost entirely overcome, while the oscillating motion of the vessel under the disturbing influence of the waves is greatly reduced.

"The extreme movements of an ordinary vessel in rolling when moving at right angles to the direction of the sea are shown in Figs. 8 and 9. It will be observed that the first effect of the sea is to rise up the side and force the hull obliquely over, so as to assume the position shown in Fig. 8. Here an air-space *o t u* on one side is submerged and is exerting an upward pressure, and a space *o v s* on the other side is elevated out of the water, and is exerting a downward pressure by reason of its weight. These two forces, working together, therefore tend to roll the boat back to the line of balance; but by reason of the effect of the waves, the momentum acquired, and the masts and superstructure overhanging the center of gravity the vessel moves past the line of balance and assumes the position shown in Fig. 9. The reversed motion now takes place, so that the boat continues to oscillate from side to side, precisely in the same manner as when pitching and on exactly the same theory. The movements of the vessel in rolling, however, are much greater than when pitching, from the fact that the width is much less than the length, and therefore offers less resistance to the water in moving, and from the additional fact that there is a greater space exposed to the action of the wind and waves.



"The effect of a side sea on a vessel of my design is entirely different from that on an ordinary vessel. From an inspection of Figs. 10 and 11 it will be evident that a wave in striking a hull of my design from the side will strike a glancing blow and will roll up on the rounded top a portion of the way toward the center. The first effect of the sea in striking the vessel might be to careen the vessel slightly to one side or to move the hull bodily to one side; but any rolling movement of the hull must necessarily be very slight by reason of the low-curved surface exposed to the waves and wind and the glancing character of the blow of the waves thereon. Any rolling movement to one side which might be caused by the action of the waves is immediately counteracted by the weight of a wave on the curved side of the hull exposed to the waves and by the friction and weight of the wave and sliding back. What I desire to secure by letters patent, is as follows: In a steam tow-boat a hull having a curved top, spoon-shaped bow, and a skeged stern, and with a normally high load line, so that when pitching the bow or stern will be entirely submerged, whereby the weight of the water thereon offers a resisting force to the submerged portion, in combination with a propeller adjacent to the skeg, and propelling mechanism."

MARINE REVIEW.

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

Chicago Office, Western Union Building, 110 LaSalle Street.
Published every Thursday at No. 516 Perry-Payne Building, Cleveland, O.

SUBSCRIPTION—$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department contain the names of 3,657 vessels, of1,183,582.55 gross tons register in the lake trade. In classification of this fleet the lakes have more steam vessels of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of steam vessels of 1,000 to 2,500 tons on the lakes on June 30, 1892, was 321 and their aggregate gross tonnage 534,490.27; in all other parts of the country the number of this class of vessels was, on the same date, 217 and their gross tonnage 321,784.64. The classification of the entire lake fleet is as follows:

Class.	Number.	Tonnage.
Steam vessels	1,631	763,063.32
Sailing vessels	1,226	319,617.61
Canal boats	731	75,580 50
Barges	69	25,321.12
Total	3,657	1,183,582.55

Tonnage built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	No. of boats.	Net Tonnage.
1888	222	101,102.87
1889	225	107,080.30
1890	218	108,515.00
1891	204	111,856.45
1892	169	45,168.98
Total	1,038	473,723.60

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

	St. Mary's Falls Canal.			Suez Canal.		
	1892.	1891.	1890.	1892.	1891.	1890.
No. vessel passages	12,580	10,191	10,557	3,559	4,207	3,389
Ton'ge, net regist'd	10,647,203	8,400,685	8,454,435	7,712,028	8,698,777	6,890,014
Days of navigation..	223	225	228	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

THE terrible disaster Wednesday resulting in the loss of four members of the Cleveland life saving crew, while attempting the rescue of two young men carried into the high seas of the lake by a swift river current, will excite unusual sympathy throughout the entire country. Lives given up in such a noble service are dear to a nation, however great it may be, and yet the congress of the United States has dallied for years over several measures tending to better the condition of the grand army of men who give up their services to this cause. They are poorly paid and are given employment in many stations on the coast as well as on the lakes during only a portion of the year. Increase their allowance with a view to keeping picked men in the service, and in the name of humanity pension them when the best years of their lives have been given up to such a calling.

ABOUT $340,000 was paid to labor last year for trimming in the holds of vessels 8,500,600 tons of iron ore moved by water from the different upper-lake shipping ports. There is money and progress in a machine that will do this work effectively and at a reduced cost, and there is also a question of labor involved that is of interest to the several lake towns where a very large number of men find employment at this work. A machine will be found to do the work and cause an increase of ore shipments that will be an indirect return for the labor thrown out of employment. One type of machine intended for this purpose, and which is being given a trial on the steamers of the American Transportation Company of Fairport, is said to be working well.

WHAT will become of Canada's ship building industry when, if present expectations hold good, the locks of the St. Lawrence system of canals are completed, three years hence, to 14 feet in depth and 255 feet in length? The dominion has a few plants equipped for the construction of metal boats,but if our neighbors in the shipping business across the lakes are at present patronizing Clyde builders and bringing the vessels through the canals in sections, the custom will certainly increase when it will not be necessary to follow this expensive practice. In the meantime it behooves American lake interests to keep an eye on protection to the coasting trade, which might be seriously hampered by cheap British built ships, even of canal size.

IN one run of twenty-four hours, during the passage last week in which the new Cunard liner Campania surpassed all previous records for a western voyage, the big boat made 517 miles, or an average of 21.6 miles, but there are no reports as yet attainable regarding high speed for short periods. This breaking of records on a first round trip would seem to indicate that the new boat is to meet the expectations of her builders and owners.

Gen. James A. Dumont.

No officer connected with the several branches of the United States treasury department exercising supervision over the shipping of the country is better known than James A. Dumont, who gets the title of general from the position which he holds, that of supervising inspector general of steam vessels. None have been subjected to more general criticism from newspapers—some of which are of high standing—and none, excepting this chief officer of the inspection service, have managed to hold office through numerous administrations. A possibility of a change in this office brings up speculation at present as to who General Dumont's successor may be, and causes reference in many quarters to his strange career in office. He is shrewd, courteous and obliging, but the army of supervising and local inspectors who have held office with him are as far from knowing him, in matters pertaining to the political influences that make the service objectionable in its present operations, as they were before they began duty under his charge. A letter addressed to the office of the supervising inspector general has never missed a reply, and yet there is a standing criticism among those who have had occasion to address many such letters that in all the years since Gen. Dumont has held the office a direct and conclusive answer has never been received to any question that might be asked. He has been on many sides of various subjects, but always certain to fetch up on the side of greatest influence with the secretary, congress or the president. On this score President Uhler of the Marine Engineers' Beneficial Association has been telling a story around the lakes that relates to the general and the recent controversy with the treasury department over the retention of foreign engineers on the American steamers Paris and New York. When the question was taken up by the engineers, Gen. Dumont was visited first in Washington by President Uhler, who was pleased and encouraged by a ready and earnest declaration from the inspector general that the retention of foreign engineers was against American principles, was illegal and an outrage. An offer to accompany Mr. Uhler on his mission to Secretary Foster was accepted, but when it was found that the secretary had decided views in favor of retaining the old engineers a change came over the chief inspector. In the language of Mr. Uhler, "he had shut up like a jack knife," and upon regaining his bearings gave a smooth and polished exhibition of juggling with questions of law and justice that was astounding.

Such is the familiar manner in which characteristics attributed to the present head of the inspection service are often referred to, but he is withal a careful, able and experienced officer who might act differently under laws in the service that would require less political shrewdness to retain office.

Send to the MARINE REVIEW $1 for a 7x9-inch well-mounted photograph of the largest steamer on the lakes, the S. S. Curry.

Iron Mining.

VALUE OF LEADING STOCKS.

Quoted by Chas. H. Potter & Co., No. 104 Superior St. Cleveland, O.

Stocks.	Par Value.	Bid.	Asked.
Cleveland-Cliffs Iron Company	$100 00	$ 56 00	$ 60 00
Champion Iron Company	25 00	28 00	.....
Chandler Iron Company	25 00	.....	38 50
Jackson Iron Company	25 00	.....	75 00
Lake Superior Iron Company	25 00	31 00	.....
Minnesota Iron Company	100 00	.....	60 00
Pittsburgh & Lake Angeline Iron Co.	25 00	.....	140 00
Republic Iron Company	25 00	.....	9 75
Ashland	25 00	.....	.....
Section Thirty-three	25 00	1 00	.....
Brotherton	25 00	2 00	2 50
Iron Belt	25 00	2 40	2 75
Aurora	25 00	6 50	7 00

Prices asked at Duluth on some of the stocks of Missabe range companies are: Biwabik $25, Cincinnati* 90 cents, Clark 60 cents, Great Northern $7.25, Keystone 60 cents, Kanawha $1.22, Lake Superior* $3.05, Little Missabe $4.10, Lincoln 45 cents, Mountain Iron $75, Minneapolis 25 cents, Missabe Mountain $16, Shaw $3.05, Security Land and Exchange Company (par value $10) $35, Washington 75 cents, Adams $11, Great Western $4, McKinley $23, Missabe Chief $6, Buckeye $2.50, Ohio $11, Standard Ore* $1. The star indicates a par value of $25. In all other cases the par value is $100.

Ex-Governor Campbell of Ohio figures in another Missabe range company, the Mascotte Iron Company, incorporated recently under the laws of Illinois. The company will operate in the western part of the range. Officers are: Frank Barrett, president; J. E. Campbell, vice president; K. W. Brown, secretary; H. G. Becker. treasurer.

Plans to Designate Light Houses by Numbers.

Captaid F. A. Mahan, engineer seeretary of the light-house board, writes us, in reply to an inquiry, that recent tests by the board of a new lens at New Haven, Conn., were only preliminary to see what changes might be needed in the apparatus in order to have it work properly for the official tests,which will be made, it is hoped, sometime during the present month. The idea of the proposed new system of characteristics is simply to have each off-shore light show a number, and to keep on constantly repeating this number at intervals, say of twenty or thirty seconds. The mode of doing this will be very similar to that used in the fire departments of cities, by ringing out numbers on gongs in the engine house,the only difference being that in this particular case the number will be indicated by a flash of light instead of by a stroke of the gong.

Notices to Mariners.

United States Engineer E. A. Ruffner, stationed at Buffalo, has issued the following circular; Under the contracts for the extensions to the harbor, breakwater operations have begun. Alignment piles are driven for 800 feet to the south for the extension to the main breakwater, and piling for the outer 1,600 feet of the shore arm is or will be driven, and also a clump on the prolongation of the shore end of that structure. All these will be dangerous at night time for vessels around the south end of the breakwater. A general warning only is now given.

On or about June 15 the third order fixed white light at Whitefish point light station, southeast part of Lake Superior, will be changed to a fixed white light varied by a red flash every 20 seconds. The order of the light will not be changed. For a few nights immediately preceeding the change a fixed white light of a lower order will be exhibited from the tower.

Capt. McCullough of the Lehigh Valley steamer Seneca found a dangerous reef, while trying to make Buffalo harbor in a fog, Tuesday morning. The spot is seven miles out of the harbor and three miles from the south shore. It is all the more dangerous on account of the distance from shore. Capt. McCullough describes the location as being south by west, half west of the breakwater light. He placed a bouy on it and an investigation will be made. The reef is narrow but composed of large boulders.

Mr. J. F. Holloway, who was so well known on the lakes as the head of the old Cuyahoga Works of Cleveland, but who is now with Henry R. Worthington of New York, spent three days in the city last week.

White Star Ships.

More reports from England about the boat or boats that Harland & Wolff of Belfast are to build for the White Star line seem to be as misleading as anything that has been said in the past. The latest rumor along this line is contained in the following from London: "The White Star line has given an order to Harland & Wolff for the construction of a steamer 800 feet long, which, the firm is confident, will beat anything afloat. The only difficulty for such a gigantic vessel will be the shallow water at the Mersey bar, but the White Star company is arranging to have larger tenders meet the great steamship further out. The firm is at present hurrying the completion of the Gothic, 500 feet long and of 8,000 tons. The Gothic is being built on a new principle as to the engines and steering gear, and is expected to equal the speed of the Campania and her sister steamer, as yet unlaunched, the Lucania. The Gothic will be launched about the end of June."

As all reports regarding actual work of construction on the Gigantic, the White Star vessel of 700 feet and 45,000 horse power, have recently been denied, the foregoing cablegram seems to be doubly misleading. There is no doubt that the White Star company will build a vessel that will probably be superior to the Campania, but it is not at all likely that an attempt will be made to construct such a craft as that referred to above.

Official Numbers and Tonnage.

The bureau of navigation, E. C. O'Brien commissioner, assigned official numbers and tonnage to the following lake vessels during the week ending May 13: Steam—Merida,Detroit, 3,261.44 tons gross, 2,609.83 net, No. 92,514; L. R. Doty, Cleveland, 2,056.34 tons gross, 1,709.30 net, No. 141,272; Gerald, Chicago, 41.94 tons gross, 20.97 net, No. 86,247; Boston, Chicago, 11.16 tons gross, 6.44 net, No. 3,583; New York, Chicago, 11.16 tons gross, 6.44 net, No. 130,625; Portland, Chicago, 11.16 tons gross, 6.44 net, No. 150,623. Sail—Goodenough, Marquette, Mich., 16.80 tons gross, 15.96 net, No. 86,249; Gladys, Marquette,Mich., 11.58 tons gross, 11.00 net, No. 86,248: Flora V, Marquette, Mich., 8.79 tons gross, 7.30 net, No. 120,635; Hustler, Detroit, 9.29 tons gross, 8.83 net, No. 96,219; Santa Maria, Marquette, Mich., 7.50 tons gross, 7.12 net, No. 116,560. Unrigged—H. W. Stanford, Buffalo, 124.79 tons gross, 118.55 net, No. 96,221.

Launch of the Manitou.

At Chicago on Saturday next, the launch of the Lake Michigan and Lake Superior Transportation Company's steamer Manitou will be attended by a fitting entertainment of guests of both the Chicago Ship Building Company and the transportation company. Invitations announce that the new steamer Arthur Orr, which has been fitted out for world's fair excursion pnrposes, will convey the guests from the L. M. & L. S. T. Co's. Rush street wharf to South Chicago, and preparations have been made for adding a pleasant excursion to the novelty of the launch. This elegant passenger boat was described at length and illustrated in the REVIEW of Feb 16.

Record of Opening of Navigation on Lake Superior.

It is remarkable that although the Straits of Mackinac were open this year on April 17 and the St. Mary's Falls canal on April 30, the first vessel, the George W. Robey, did not get into Duluth until the morning of May 9. Two Harbors was open to navigation on the same date as Duluth and Superior.

The Cramps are about to launch a steel boat for Mr. J. Harvey Ladew that will undoubtedly be among the fastest in this country. She is 180 feet on the water line, 23 feet beam and will draw 10 feet 6 inches. Cylinders of her quadruple expansion engines are 21½, 31, 34 and 34 inches, and the stroke of piston 30 inches. The boilers are of the tubulous type.

Additional copies of the lithograph supplement of one of the new Northern line passenger ships which appeared in the last issue of REVIEW will be sent to any address for 40 cents each. In mailing the picture a tube will be used to protect it from injury.

U S. ENGINEER OFFICE, 34 West Congress Street, Detroit, Mich. May 11,1893. Sealed proposals for dredging at "the elbow" in Lake Grorge, Saint Mary's River, Michigan, will bereceived at this office until 2 p. m., June 10, 1893,and then will be publicly opened. Specifications,blank forms, and all available information will be furnished on application to this office. O. M. POE, Colonel, Corps of Engineers, &c. 11-18-25-1

Speed Premium Earnings.

A great deal of interest is manifested in naval circles in the premiums earned recently by the United States cruiser Detroit on her speed trial, when she made an average of 18.71 knots an hour on a run of four consecutive hours. She surpasses all vessels of the navy in the percentage of her speed premium earnings to total cost. Her contract called for 17 knots, and allowed $25,000 for every additional quarter knot and the same rate for fractions of a quarter. The result is that for her 1.71 knots in excess of the requirements the builders are to receive $171,000. This is not only the largest excess of speed over the guarantee ever known in our navy, but it is extraordinary in comparison with the size and contract cost of the vessel. For example some comparisons are made in the following table:

	Contract price.	Displacement tons.	Premium earned.
Detroit	$ 612,500	2,000	$171,000
Baltimore	1,325,000	4,600	106,442
Philadelphia	1,325,009	4,324	135,600
Yorktown	455,000	1,700	40,000

The Detroit was built by the Columbian Iron Works. Her builders are also completing a sister ship, the Montgomery, on exactly the same plans and stipulations. There is no reason to doubt that she will do as well as the Detroit. If she should the total earnings for premiums by the Columbian Iron Works on the two vessels will be $342,000, which is certainly a large bonus on a contract of $1,225,000.

The New Inland Lloyds Register.

Capt. James Millen of Detroit, who was in Cleveland recently with Mr. A. A. Parker, his partner in business, says that the committee of vessel owners and underwriters in charge of the insurance register, of which he is a member, has heard very little complaint on account of ratings or valuations in the new book. The changes were not numerous, but a very large number of vessels are given no rating at all. This is due largely to the fact that in all cases where vessels were thought to be in need of repairs, and owners did not ask for inspection after being notified that repairs were needed, the committee decided not take it upon themselves to reduce the classification, although underwriters were, of course, informed regarding such vessels. Capt. Millen says that the question of payment of the inspection duss agreed upon at the meeting of vessel owners and underwriters last winter was not considered in passing upon ratings where vessels were not in need of improvements.

Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on May 13, 1893:

	Wheat, bu.	Corn, bu.
Chicago	19,993,000	1,912,000
Duluth	15,214,000	34,000
Milwaukee	1,357,000	10,000
Detroit	1,428,000	8,000
Toledo	2,806,000	192,000
Buffalo	3,667,000	877,000
Total	44,405,000	3,033,000

At the points named there is a net decrease for the week of 1,938,000 bushels of wheat and a decrease of 1,430,000bushels of corn. In addition to the above stocks, there was afloat in lake vessels at Duluth 116,000 bushels of wheat.

At present the fastest cruiser in the world is owned by the Argentine government, having been built for them by Sir W. Armstrong, Mitchell & Co., of Newcastle. She is named the De Julio, and has a displacement of 3,500 tons. She steams 22 knots with natural and 22¾ with forced draughts.

Personal Mention.

Messrs. Doran and Alberger, representing Henry R. Worthington of New York were in Cleveland Saturday on their way east.

Capt. Geo. Wilson, at the ferry custom house Detroit, has in his keeping an elegant silk flag 6 by 6½ feet which will be presented to the Ship Masters' Association No. 7 of Detroit by James Graham.

Horace See of New York, consulting engineer of the Newport News Ship Building Company and superintending engineer of the Morgan line, has recently been appointed superintending engineer of the Cromwell line.

Capt. E. M. Peck of Detroit, James McBrier of Erie, Manager Ricketson of the Inter-Ocean fleet of Milwaukee, and Capt. John Shaw accompanied by one of the Eddy brothers of the Eddy Transportation Company, Bay City, were among the vessel owners who called on ore sales agents in Cleveland since a few freight contracts were made last week. The Eddy brothers seem to be gradually withdrawing a large portion of their interests in Michigan lumber business. They recently purchased the Platt mine, a Marquette range iron property that shipped 2,626 tons last year, The product of this mine will furnish employment for a part of their vessel tonnage.

It is announced from Washington that Light-House Inspector John J. Read, who has been in charge for a few months past of the eleventh district, with headquarters at Detroit, has been promoted to the captaincy in the navy, made vacant by the death in New York city of Capt. Gilbert C. Wiltse, who commanded the Boston at Honolulu at the time of the hoisting of the American flag there. It is probable that Capt. Read will be placed in command of one of the new vessels now under construction. Lieut.-Commander William W. Mead has been appointed light-house inspector, to succeed Capt. Read, and will arrive in Detroit and assume his duties June 1. He has but recently returned from sea duty in command of the corvette Essex, and is at his home in Kentucky.

In General.

Some of the English journals are claiming that the Campania, the Clyde's latest and greatest production, is given to excessive vibration, and that this defect in the big boat is one of the reasons why so much secrecy was maintained about the result of numerous trial spins which were undertaken during her stay on the Clyde before making the Atlantic voyage.

During 1892 nearly 250,000 cars passed through the tunnel of the Grand Trunk Railway under the St. Clair river at Port Huron and Sarnia, and the business for the current year will probably reach 275,000. The traffic eastward and westward is about equal, 111,193 freight cars having moved east and 110,004 west; the passenger cars numbering 10,768 east and 10,891 west.

Trade Notes.

In the same notice that tells of a fire in its foundry department, the Penberthy Injector Company, Detroit, Mich., announces that all damage will be repaired in about ten days, when all delayed orders will be filled, as well as new ones that have been received in the meantime.

Within a few days of last week the Sheriffs Manufacturing Company of Milwaukee shipped to Ashland an 8-foot wheel for the tug Keystone and a 5-foot 2-inch wheel for the tug Minnie Karl; an 8-foot wheel to the tug Gregory at Cleveland; a 5-foot 10-inch wheel for Sam Elmore's passenger and fish steamer R. P. Elmore at Astoria, Ore.; also a 6-foot 6-inch wheel for one of the Williams, Dougherty & Upham tugs, and a 7-foot wheel for the tug Record at Duluth.

Following is a list of the vessels built by lake shipbuilding concerns and fitted with Providence windlasses and capstans, manufactured by the American Ship Windlass Company, Providence, R. I.: Union Dry Dock Company, Buffalo, N. Y., 34 vessels; Jackson and Sharp Company, Wilmington, Del., 16; Cleveland Ship Building Company, Cleveland, O., 19; F. W. Wheeler & Co., West Bay City, Mich., 69; Simon Langell & Sons, St. Clair, Mich., 9; Capt. James Davidson, West Bay City, Mich., 41; Globe Iron Works Company, Cleveland, O., 27; American Steel Barge Company, Superior, Wis., 23; William Dulac, Mt. Clemens, Mich., 6.

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Duluth, Minn,
West Superior, Wis.
Hancock, Mich.
Marquette, Mich.
Sault Ste. Marie, Mich.
Michigan Central Railway & 10th St., West Bay City, Mich.
Eighth & Sears Sts., Saginaw, Mich.
46 Jefferson, Detroit, Mich.
Summit & Monroe Sts, Toledo, O.

ATLANTIC REFINING COMPANY, French & 16th Sts., Erie, Pa.
D. ROBESON, Port Huron, Mich.
W. S. MCKINNON, Ashtabula Harbor, O.
HULL & RAND, Huron, O.

STANDARD OIL COMPANY, Star Oil Works, Buffalo. N.Y.
BABY & DALE, St. Clair, Mich.
N. C. ALTEN, Lorain, O.
A. F. HARRINGTON, Conneaut Harbor, O.

A. H. MCGONAGIL, South Chicago, Ill.
MARINE SUPPLY CO., Fairport, O.
F. KRANZ, Sandusky, O.
THE M. I. WILCOX CORDAGE & SUPPLY CO., Toledo, O.

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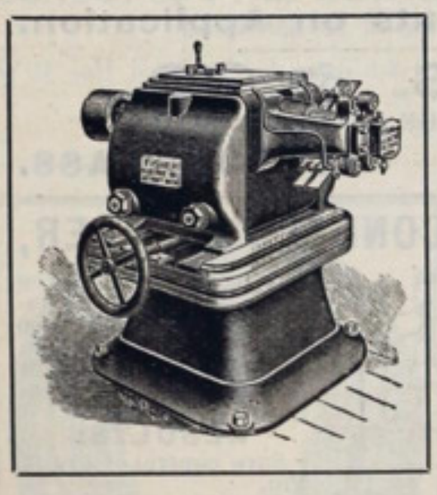
TUG DELTA, Cylinder 20 by 22, Steam Pressure Allowed, 105 pounds.
TUG OWEN, Cylinder 20 by 20, Steam Pressure Allowed, 104 pounds.

CENTRIFUGAL PUMPS, Seven and Fourteen Inch Suction.

UNITED STATES ENGINEER OFFICE, Telephone Building, Detroit. Mich, April 26, 1893. Sealed proposals for dredging Black River at Port Huron, Michigan, will be received at this office until 2 p.m. on Wednesday, the 31st day of May, 1893, and then publicly opened. Specification blank forms and all available information will be furnished on application to this office. WILLIAM LUDLOW, Major of Engineers, Bvt. Lieut. Col. U. S. A. 11-18



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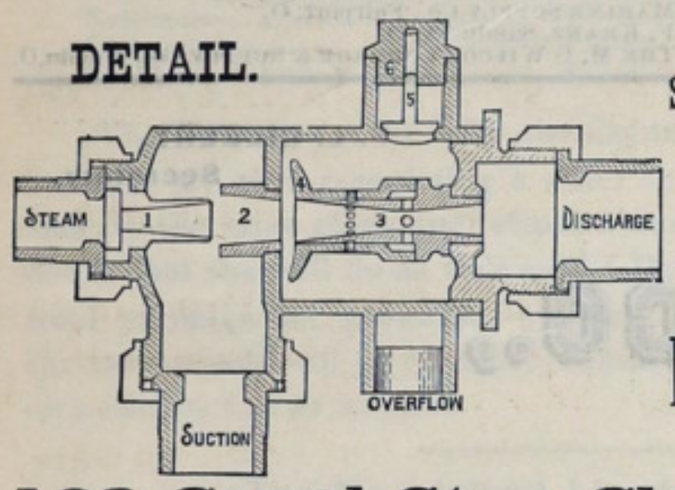

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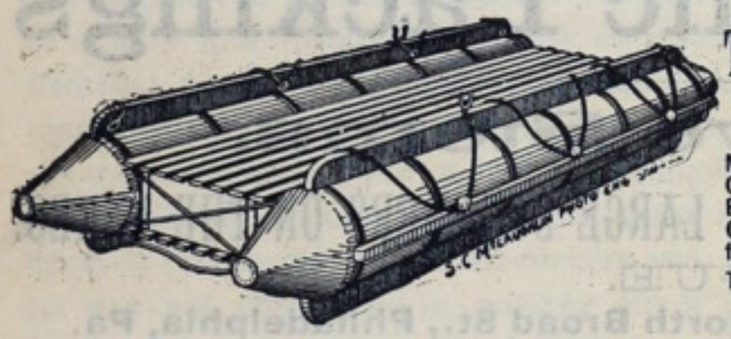

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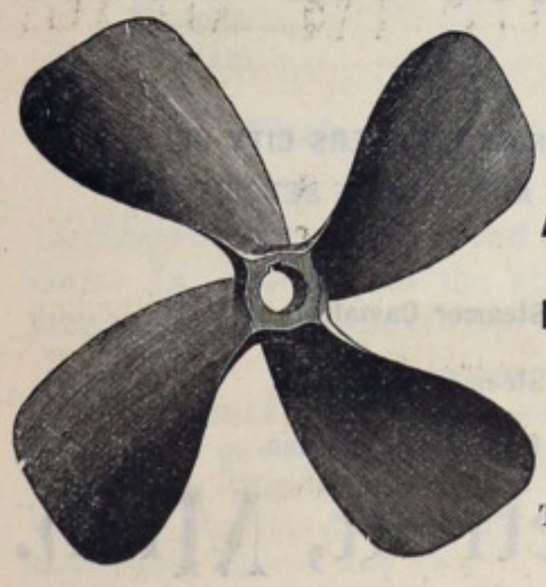

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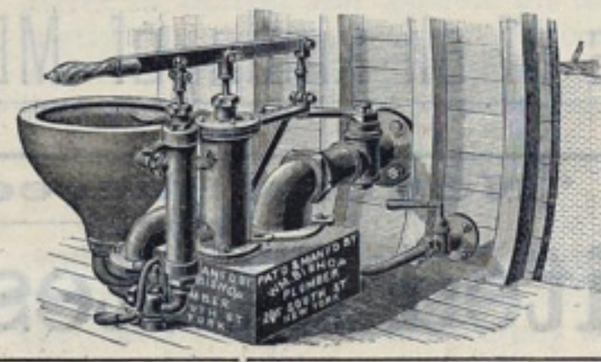

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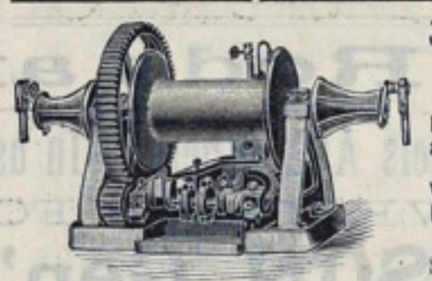

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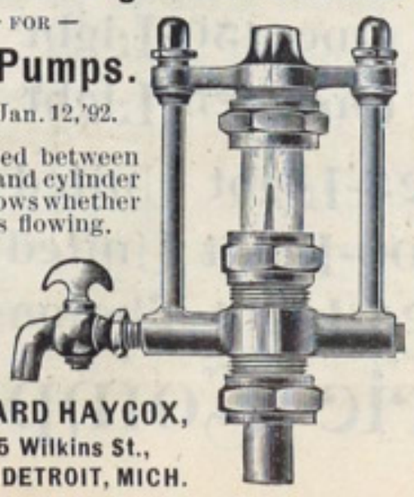

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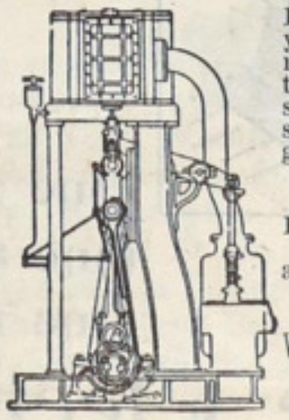

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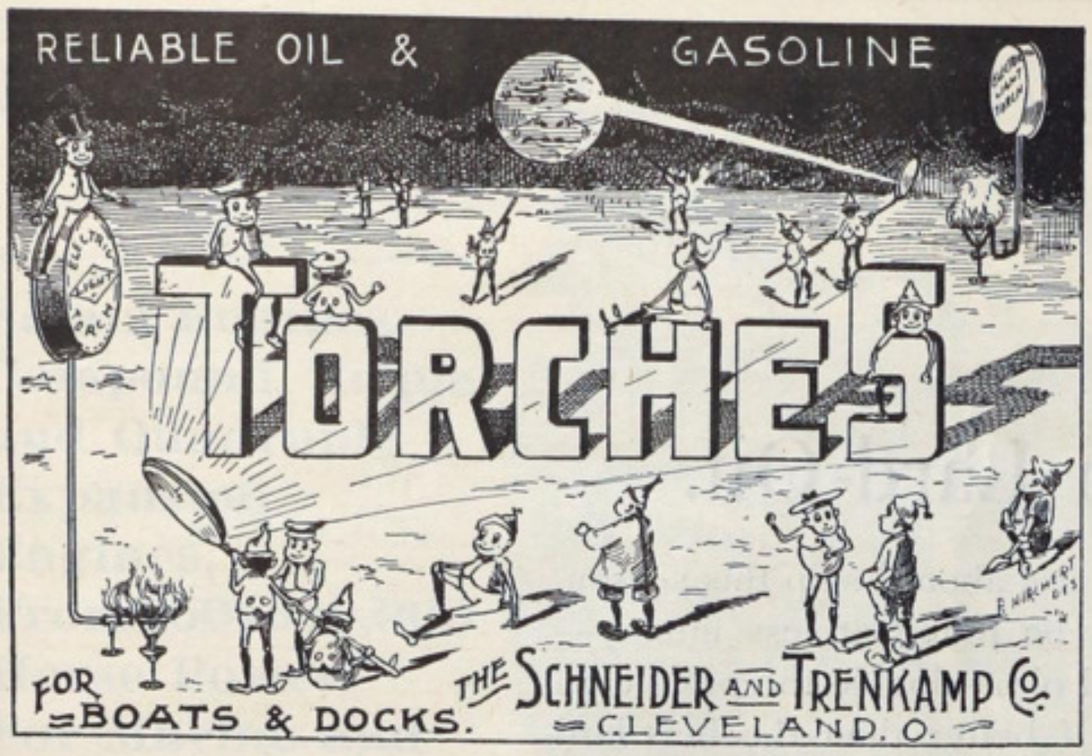

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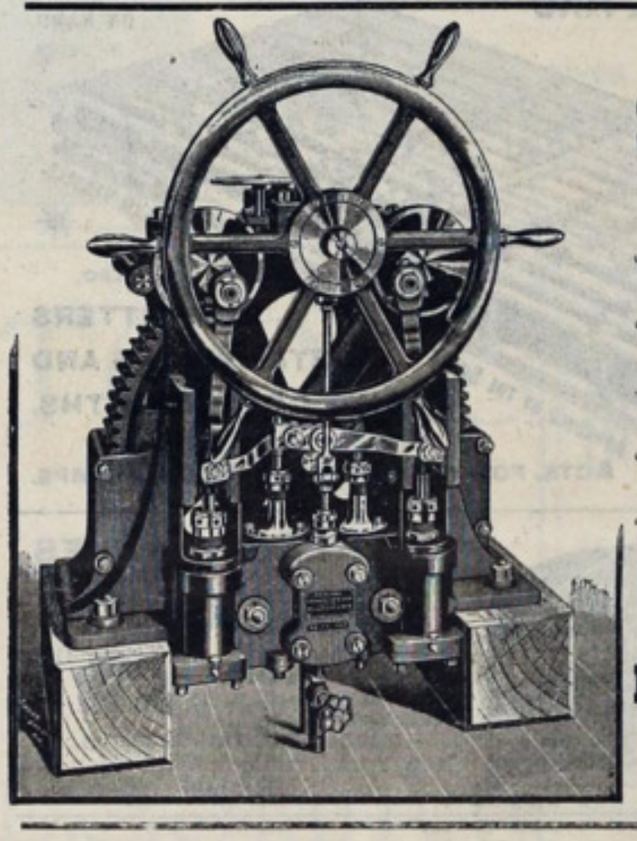

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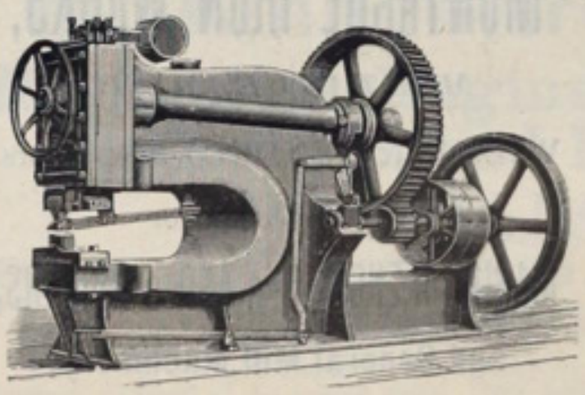

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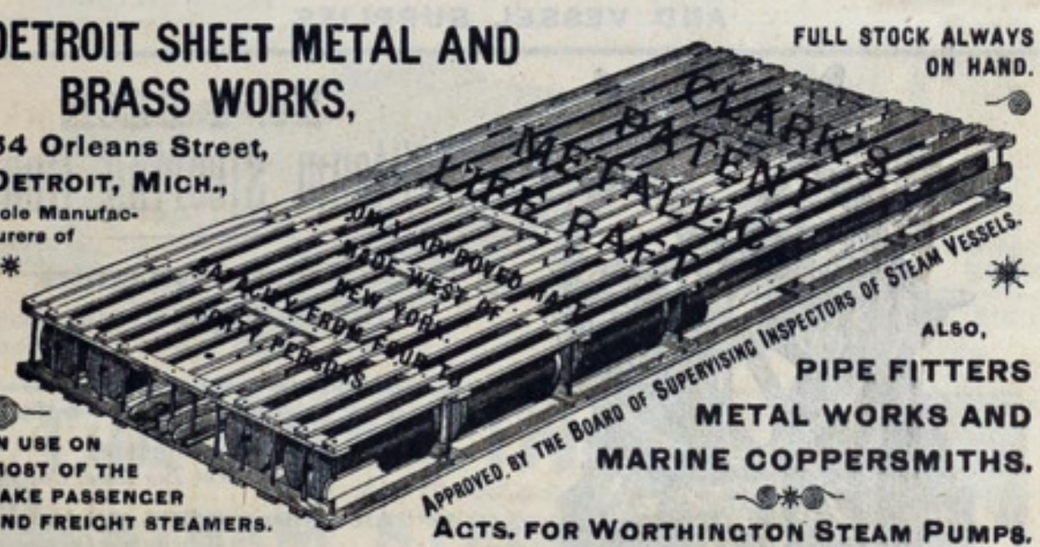

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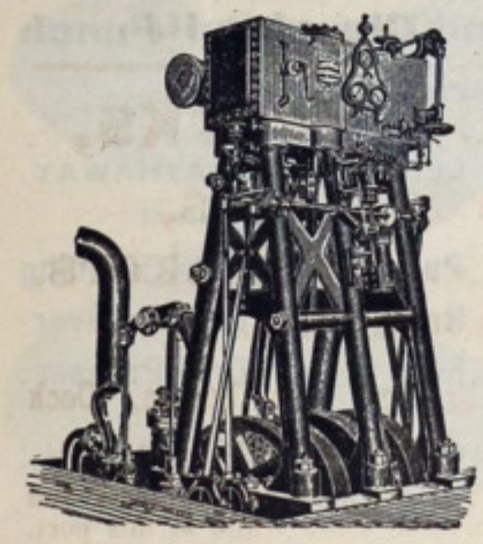

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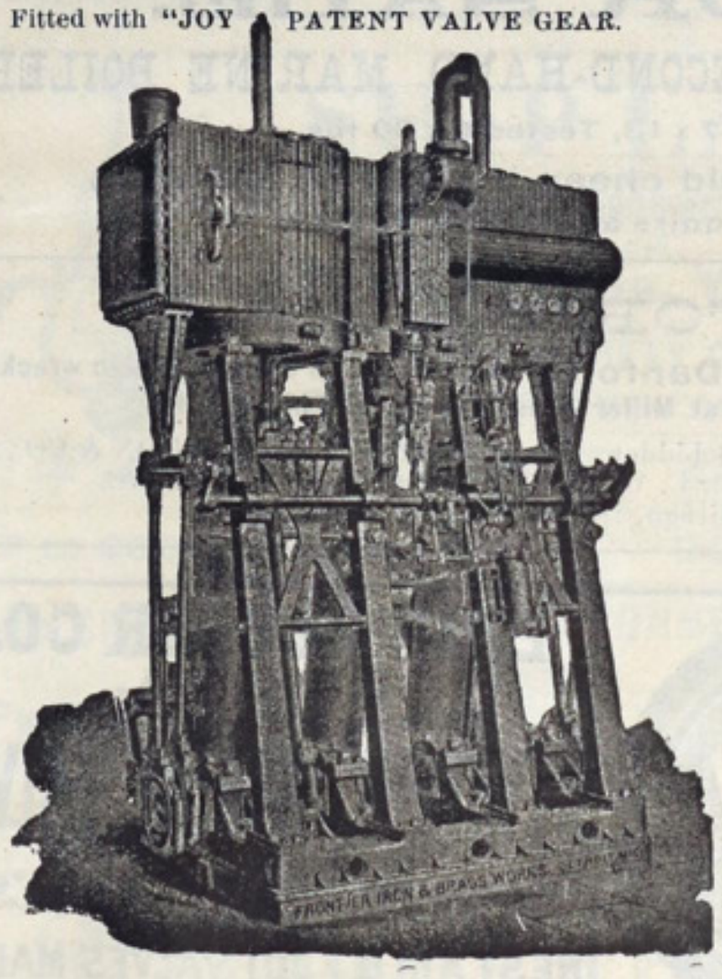

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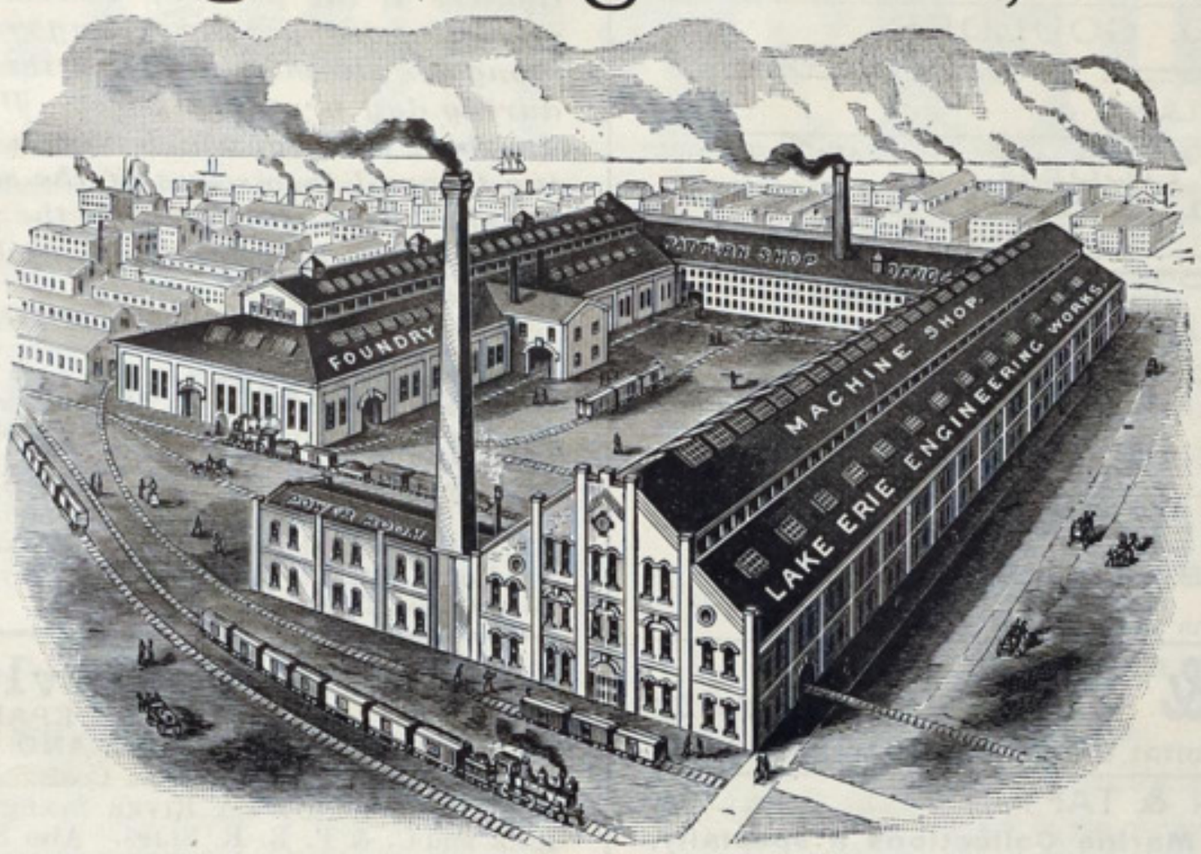

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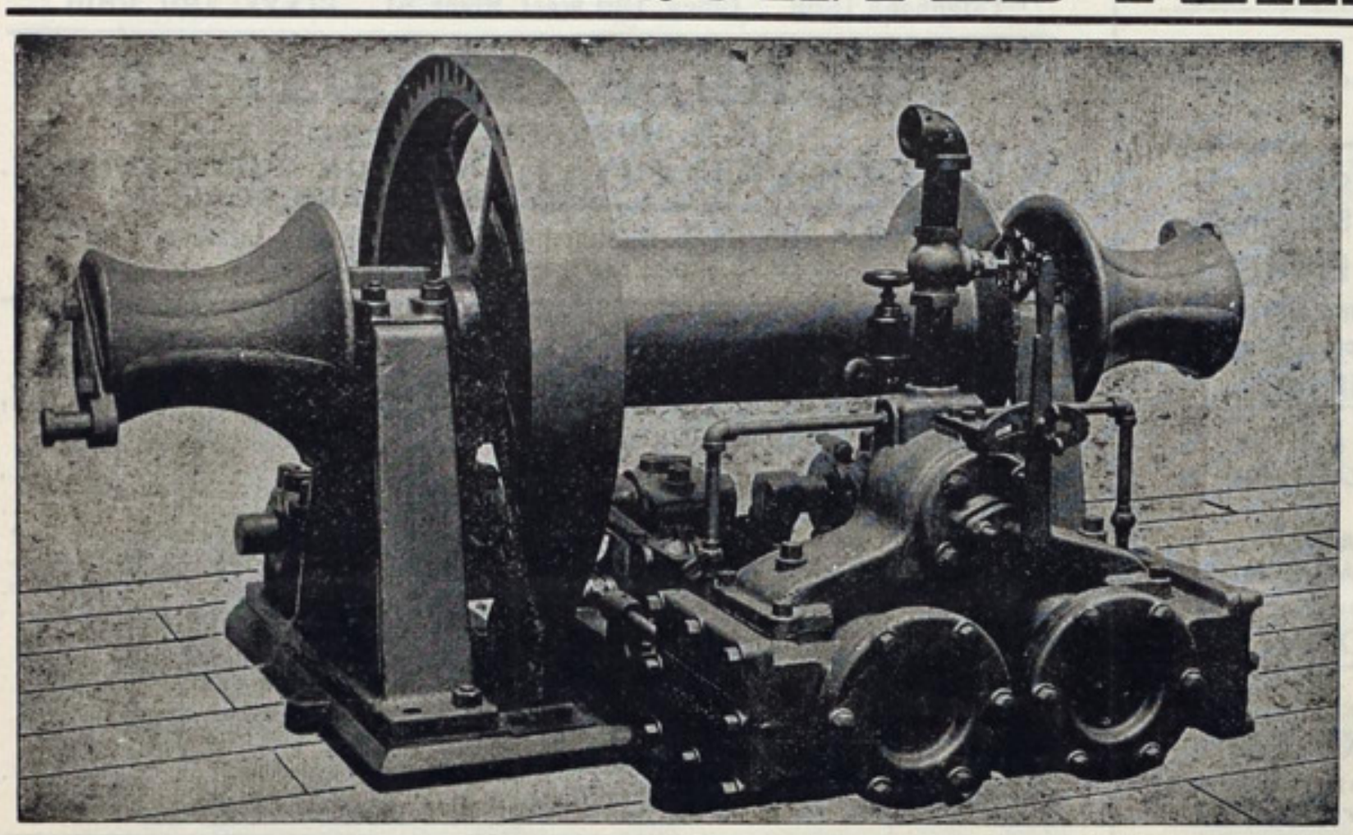

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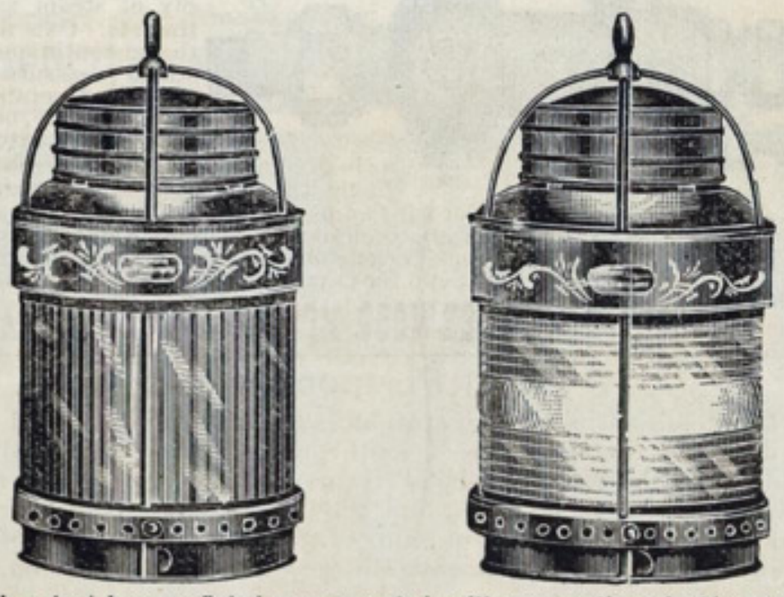

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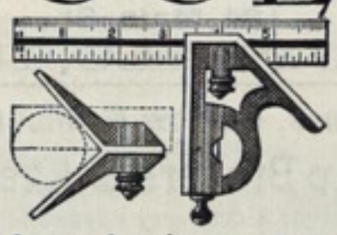

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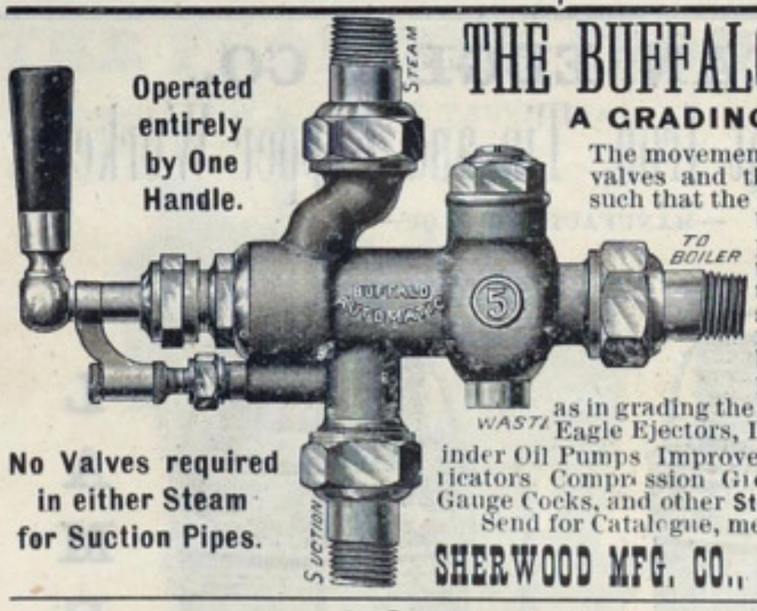

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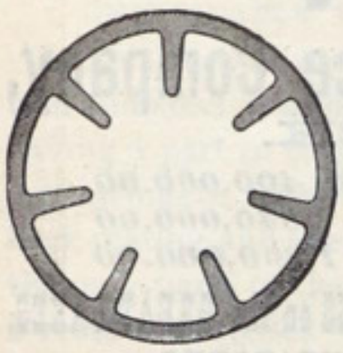

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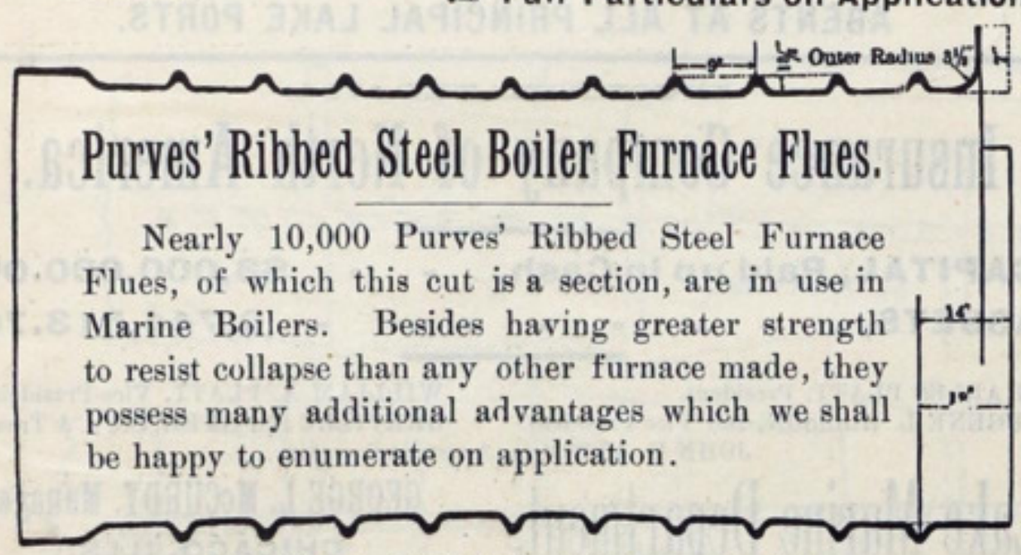

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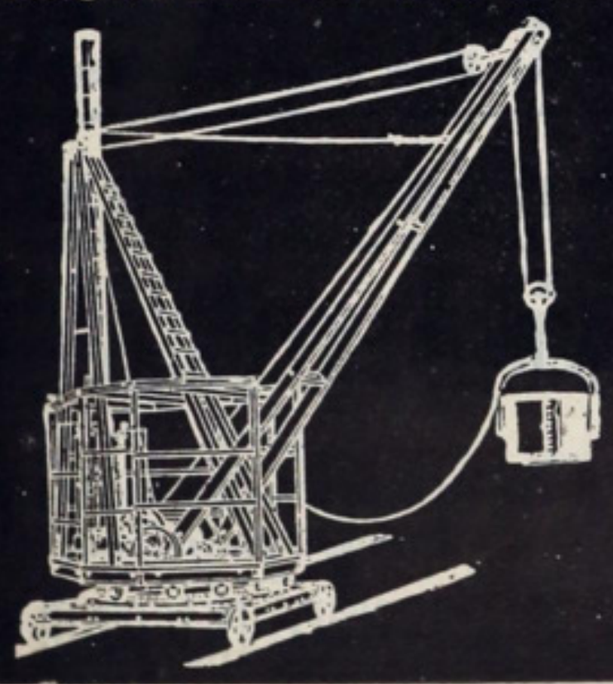

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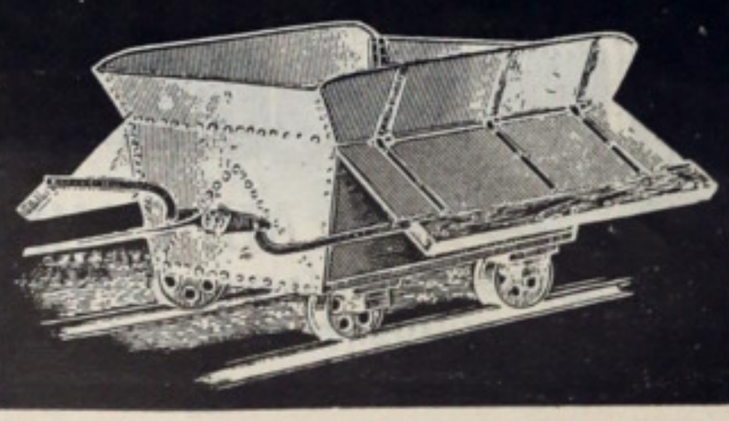

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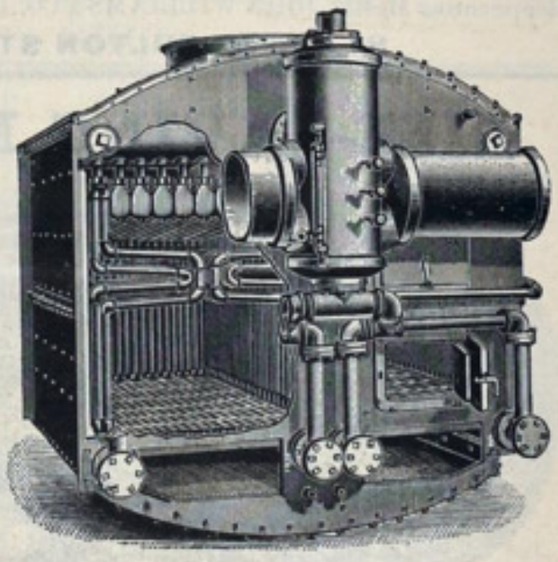

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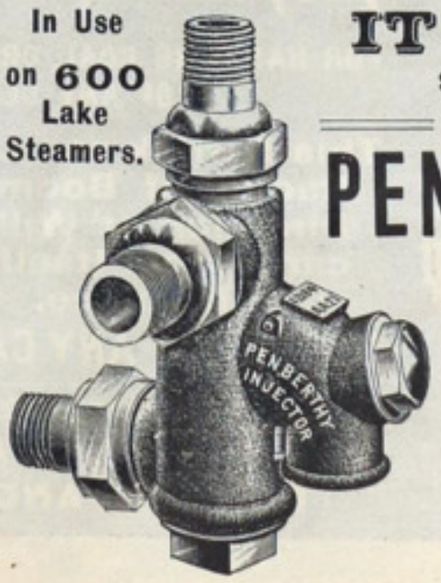

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